

CEC 2025 Numerical Global Optimization Competition on GNBG-II generated Test Suite

Description:

This competition invites prospective researchers to evaluate the performance of their algorithms on a newly designed set of **24 problem instances** generated using the **Generalized Numerical Benchmark Generator (GNBG)**. While the same GNBG framework has been used in GECCO 2024, the 2025 competition introduces **new problem instances** that have been carefully crafted to add **greater complexity** compared to those used in previous competitions.

The updated test suite features enhanced problem characteristics, designed to push algorithmic boundaries further and provide an even more rigorous assessment of optimization capabilities. The 24 instances are categorized as follows:

- **Unimodal Instances:** (F1 to F6) – Smooth, single-peak landscapes with more intricate scaling and conditioning challenges to evaluate convergence efficiency.
- **Single-Component Multimodal Instances:** (F7 to F15) – Complex terrains with multiple local optima, now incorporating higher levels of ruggedness, asymmetry, and deceptiveness.
- **Multi-Component Multimodal Instances:** (F16 to F24) – Highly intricate landscapes with interacting components, featuring stronger variable interdependencies and nonlinear basin structures to challenge robustness and adaptability.

The 2025 problem instances have been enhanced with additional layers of complexity, such as:

- **Increased Modality:** More local optima to challenge exploration.
- **Heightened Ruggedness:** Rougher landscapes to test adaptability.
- **Advanced Deceptiveness:** Complex traps that demand strategic navigation.
- **Dynamic Features:** Problems that evolve or shift during optimization.
- **Tighter Variable Interactions:** Stronger dependencies between variables.

This competition not only deals with finding optimal solutions, it makes algorithms navigate these more demanding terrains, adapt to unique challenges, and traverse deceptive landscapes in their quest for finding global optimal solution.

By participating in this rigorous competition, researchers will contribute to advancing the state of the art in global optimization and gain valuable insights into algorithmic behavior under increased complexity. We warmly invite the research community to take part in this 2025 edition and subject their algorithms to the next level of benchmarking.

Submission deadline: 31 May 2025

Official webpage: <https://dsmlossf.github.io/GNBG-Competition-CEC2025/>

Organizers :

- **Amir H. Gandomi**

Amir H. Gandomi is a Professor of Data Science and an ARC DECRA Fellow at the Faculty of Engineering & Information Technology, University of Technology Sydney. He is also affiliated with Obuda University, Budapest, as a Distinguished Professor. Prior to joining UTS, Prof. Gandomi was an Assistant Professor at Stevens Institute of Technology, and a distinguished research fellow at BEACON center, Michigan State University. Prof. Gandomi has published over three hundred journal papers and 12 books which collectively have been cited 44,000+ times (H-index = 94). He has been named as one of the most influential scientific minds and received the Highly Cited Researcher award (top 1% publications and 0.1% researchers) from Web of Science for six consecutive years, from 2017 to 2022. In the recent most impactful researcher list, done by Stanford University and released by Elsevier, Prof Amir H Gandomi is ranked among the top 1,000 researchers (top 0.01%) and top 50 researchers in AI and Image Processing subfield in 2021! He also ranked 17th in GP bibliography among more than 15,000 researchers. He has received multiple prestigious awards for his research excellence and impact, such as the 2023 Achenbach Medal and the 2022 Walter L. Huber Prize, the highest-level mid-career research award in all areas of civil engineering. He has served as associate editor, editor, and guest editor in several prestigious journals, such as AE of IEEE Networks and IEEE IoTJ. Prof Gandomi is active in delivering keynotes and invited talks. His research interests are global optimisation and (big) data analytics using machine learning and evolutionary computations in particular.

- **Rohit Salgotra**

Rohit Salgotra is an Adjunct Researcher at the AGH University of Krakow in Poland. He specializes in Nature-Inspired Computing and has authored over 70 publications with Google Scholar citation of over 2350 with h-index 25. He has been listed among Stanford University's Top 2% Most Influential Scientists for the years 2021–2022, within the category of Indian researchers, and 2023 with in Polish researchers. Before joining AGH, he was a Research Officer at Swansea University, UK, where he conducted studies on the socio-economic aspects of the COVID-19 pandemic. His work scored second rank in WCCI/GECCO 2023 competition on Evolutionary Computation in "Energy Domain: Risk Based Scheduling". He has served as an academic/guest Editor of 3 journals and a reviewer for several journals, including "IEEE Transactions on Evolutionary Computing" and "Swarm and Evolutionary Computing," among more than thirty other SCI journals.

- **Kalyanmoy Deb**

Kalyanmoy Deb is Koenig Endowed Chair Professor at Department of Electrical and Computer Engineering in Michigan State University, USA. Prof. Deb's research interests are in evolutionary optimization and their application in multi-criterion optimization, modeling, and machine learning. He has been a visiting professor at various universities across the world including University of Skövde in Sweden, Aalto University in Finland, Nanyang Technological University in Singapore, and IITs in India. He was awarded IEEE Evolutionary Computation Pioneer Award for his sustained work in EMO, Infosys Prize, TWAS Prize in Engineering Sciences, CajAstur Mamdani Prize, Distinguished Alumni Award from IIT Kharagpur, Edgeworth-Pareto award, Bhatnagar Prize in Engineering Sciences, and Bessel Research award from Germany. He is fellow of IEEE, ASME, and three Indian science and engineering academies. He has published over 548 research papers with Google Scholar citation of over 149,000 with h-index 123. He is in the editorial board on 18 major international journals. More information about his research contribution can be found from <https://www.coin-lab.org>

